2. COMPU-TOTS AND OTHER JOYS OF MUSEUM LIFE

Peter Hirshberg

Public access to computer literacy programs is the newest goal of the Capital Children's Museum.

The day Future Center opened last April, more than 200 visitors flocked to the computers in "tomorrow's classroom" at the Capital Children's Museum. Radio stations and newspapers had been touting Future Center for several days, so the public arrived with all sorts of expectations.

Most Washingtonians came because they were curious; they'd heard about the "computer revolution," but still doubted that they personally would ever use one of the machines. Some were hoping for games to zap aliens throughout the universe, or a big number cruncher tamed to play tic-tac-toe. At least one father was looking for an electronic babysitter to relieve him of the kids for a few hours.

What visitors to Future Center actually find is a classroom with 20 Atari 800 microcomputers, each equipped with printer, disc drive, and color monitor. Computers ring the room along a continuous sawtooth table that affords each visitor a personal work space, and allows each student a view of the neighbor's monitor—a reassuring arrangement for first-time programers who aren't yet sure whether they're typing the right thing!

In the few months since the classroom opened, we have learned much about how to introduce the uninitiated public to computer technology, how to nurture a growing fascination with the field, and how to alter our format to accommodate the greatest possible range of ages. Future Center was created to serve a broad and diversified group: our youngest students are preschoolers who attend classes with their parents; our oldest students are senior citizen volunteers who, as part of the museum floor staff, attend beginning computer classes. Our most sophisticated students are decision-makers from Capitol Hill who are attending sessions on economic modeling and the latest innovations in computer graphics.

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Learning by Doing

The classroom is the latest project of a museum dedicated to hands-on learning. The museum's participatory exhibits invite visitors to experiment with, manipulate, build, crawl through, even try on the exhibit elements.

Future Center follows in this participatory tradition. Its purpose is to provide the experience of working with the computer, of controlling it yourself. This is simply not possible on an exhibit floor, where visitors are bombarded with things to do and each machine has several kids competing for it. Only when youngsters have an opportunity to explore a computer in depth, in Future Center or a similar classroom situation, can they begin to get the feel of *thinking with* the computer. Using the orderly, logical rules of a computer language, they develop a far more profound and elegant understanding of the computer—not merely as a specific tool, but as an aid to thought.

Future Center, then, is a public-access computer center for people in the nation's capital. Public access means that people who have no previous experience with computers can readily come in for a complete course or a single session; they can learn to program or merely become familiar with computer capabilities; they can run existing software or sign up to develop software on their own.

The idea of a public-access computer center was probably born at the Lawrence Hall of Science on the University of California's Berkeley campus. There, in 1972, a course called Creative Play with Computers was offered to the public, using teletypes and the university's time-sharing system. Over time it became a big success.

Since then, other public-access centers have been started; but the most significant ones still are in the San Francisco Bay area. Computer Town USA, in the suburb of Palo Alto, sets as its goal the computer literacy of all the kids in town. Youngsters visit the local library, where they are checked out on the microcomputers and issued a "My Computer Likes Me" button, which allows them free rein of the facility.

Such facilities serve important functions: they expose a broad segment of the nontechnological-minded population to computers, and in the process they debunk a lot of myths about the computer's being difficult or obtuse. They can also bridge the gap between the wealthy school districts that have relatively frequent access to computers and depressed areas that have little or no access to such equipment. Capital Children's Museum, for example, through its MET-Kids program, provides free access and instruction to youngsters in our neighborhood, one of the poorest in Washington, DC.

Courses for Everyone

The museum—with the assistance of Atari, which donated the computers—designed a model computer classroom and developed a curriculum of nine courses. These range from Compu-Tots (for preschoolers and their parents) to An Introduction to Programing (for adults). Compu-Tots, the first course to sell out, introduces four- to seven-year-olds to such concepts as a computer program and computer memory, and to the use of the keyboard. By their second class, these students write a graphics program that produces their initials in color.

In the process, they become enchanted with the machine. At a recent session, a seven-year-old who had previously only played arcade games told a visitor how exciting it is to control a computer, something he'd never before thought of doing. His teacher added: "Too often computers are either used in school for structured computer-assisted instruction, or they're just a game, like Space Invaders. I want the kids to realize that we control and program the computer, not vice versa."

In more advanced courses, students write programs in BASIC, then explore examples of computer applications that range from simulations to computer graphics and text processing. The Introduction to Programing for adults attracts individuals with a range of interests: mothers who want to influence their children's schools to buy computers, teenagers taking the course in the summer, young professionals, two 67-year-old women who just decided to come in and see what it was all about.

This course also features an overview of the role of computers in society and allows time for group discussion of the impact of these developments on schools, the postal system, and personal privacy. We added this feature after several students commented that while they were beginning to get a feel for programing, the idea that the computer is at work throughout society still overwhelmed them. The solution was to bring into the classroom a broad variety of computer artifacts—chips, a large disc from a mainframe computer, photographs of robots as well as other unusual applications. We found this very successful in reducing the students' fear of "computer pervasiveness."

Another course, Draw!, introduces participants to computer graphics. Students design a banner, turn a comic-book character into a computer display, and learn the principles of animation. In this course we introduce a peripheral, the VersaWriter drawing board, which allows the user to trace a picture directly into the computer memory. As an overview of the graphics field, the teacher shows segments of several videotapes on advanced animation techniques used in producing television commercials, image enhancement methods developed at NASA, or a simulated tour of the human brain. These startling and provocative tapes, usually considered esoteric, are seldom shown to the public.

A workshop for teachers with no computer experience also is slated for the fall. Teachers taking this course will receive an overview of programing and of the kinds of computers and software in use at schools; they'll also

be given a bag of computer objects—cartoons, chips, magnetic tape, and printouts—to take back to their classes.

Future Center reaches a large audience through its "group specials" for school classes, camp groups, or members of other organizations who visit the museum as a field trip. We charge $2 per hour per group member. For many schools in the region without any computers, this is the only option for giving their students computer experiences.

One of the most talked-about Future Center offerings is our Computer Birthday Party. For years, parents have been hiring clowns and magicians to entertain at their children's parties, or making the traditional trip to a ballgame or the movies. The Future Center alternative includes a chance to write a short program, play several educational games, and listen to a rousing rendition of "Happy Birthday" synthesized by an Atari microcomputer. Each child also has an opportunity to make a personalized happy birthday banner.

To our amazement, the first request for the Computer Birthday Party came not from the parent of a young child, but from the wife of a prominent architect who wanted to do something different for her husband's birthday. We ended up with an unusual group of 40 architects, lawyers, accountants, and other professionals having a blast with computers. It would not be surprising if this proved to be just the impetus some of the partygoers needed to start thinking about how they might use small computers at the office or at home.

Talented Young Assistants

Computer interns—high school and college students who have been trained to assist our teachers—are crucial to the smooth

courses. Our nine part-time interns were hired because they all had previous computer experience in school and were enthusiastic and knowledgeable enough to assist in our classes. At present, our ratio of three interns for each 20 students in Future Center allows ample assistance and permits immediate answers to participants' questions.

These assistants have proved invaluable—and full of surprises. One, a college sophomore, had moved to the Washington area and enrolled in a major university here because she had already taken all of the undergraduate mathematics courses offered at her former school in Florida. She told us she is thrilled to be working at the museum because she also teaches a freshman computer course at a local university, and has been frustrated with their slow, lumbering, and somewhat boring batch-processing system.

Another intern, a 15-year-old high school student, applied for the job in a letter that included this note: "This letter is being typed by the word processor I developed for my TRS-80. I also sell the computer games I write to publishers for extra cash." Needless to say, we were delighted to have him.

Our youngest intern, who reminds everyone that he will *soon* be 15, was already an assistant computer teacher at his high school. Soon after joining us, he visited Boston with his family for the weekend. There he spent a day with a consultant to the Capital Children's Museum who is an outstanding programer from the Massachusetts Institute of Technology (MIT). When he returned, he knew more secrets about the Atari than anyone on our staff would ever have had time to learn. We have since hired him as a full-time summer employee and loaned him a computer for the season. Now he programs at home when the museum is closed.

With students like these, it's no wonder teachers are concerned that they will encounter youngsters, even elementary school students, who know more than *they* do about computers. Eventually, when Future Center offers advanced programing courses, we expect to pick up several youngsters who have exhausted their schools' repertoire of computer courses.

Curriculum Design

The keystone in the success of this project has been the design of appropriate curriculums. Curriculum design is under the guidance of our exuberant, energetic, and imaginative head teacher, Judy Muntner, who works with gifted and talented children in Montgomery County, Maryland. Brian McGlaughlin, who has researched the use of computers in early childhood education, also has provided curriculum guidance.

The curriculum emphasizes development of programing skills in students as rapidly as possible. The youngest students who attend Compu-Tots class are supported in this by a parent, who can help the child with the small amount of reading and typing skills necessary to use the computer. Older elementary students are encouraged to experiment with the keyboard, and then given a short program to run that introduces them to computer operation.

Our course philosophy also uses the inherent fascination that children have with their own names. In a series of introductory activities, the children print their own names on the screen, print it over and over again in a loop, and learn about graphic commands by designing and creating big, colored initials that cover the entire screen. Other activities allow students to explore the Atari computer's sound generation and color graphics abilities, which stimulate students' interest.

Young computer students, and older children who sign up for our recreational Computer Lab course, are allowed to select alternative activities from our file of computer software. Favorites include *Beans* (in which you estimate the number of "beans" that appear in a jar on the screen), *Darts* (which promotes an understanding of fractions), and *Centimeter Eater* (a program developed in-house in which the user gains an intuitive feel for metric linear measurement by estimating the length of lines).

Software a Problem

One of the greatest frustrations that we have experienced is the dearth of adequate microcomputer software, specifically worthwhile educational programs. At present there are a variety of exciting games and some fascinating simulations available; but when we look for educational programs that are equally significant (in terms of what the computer can do), we find very little—and much of *that* is boring.

Educational computing is still dominated by the tenets of computer-assisted instruction (CAI)—the notion that the computer is a teaching machine that feeds the students text and questions, evaluates the response, and prescribes the next step. While highly appropriate for a limited number of specific learning situations, this approach has been overused and therefore abused, and has led to the endless production of software products that are no more than electronic pages: quizzes, drills, and frames of facts.

Truly exciting educational programing allows learners to test their own thinking actively. An open-ended programing assignment can facilitate this, as can a simulation that allows children to develop and refine their assumptions about the world.

Two computer languages that permit the user to postulate a problem and then explore it are Smalltalk, developed by Alan Kay at Xerox Parc, and Seymour Papert's LOGO, developed at MIT. LOGO, which is slowly being adapted to microcomputers, allows a child to direct the computer in open-ended explorations. Mavis Wylie, the museum's head of program development, has said that as a result of interaction with the computer using LOGO, the child's experience becomes one of cognitive exploration, rather than a lugubrious mathematical translation. When creating a program, a child is challenged to "think about thinking" (to quote Papert)—a far more desirable state than worrying about the syntax and subscripts of a more primitive computer language.

We believe the Future Center environment will be significantly enhanced when a language like LOGO is available. At present we have only two Texas Instruments 99/4 computers that run LOGO. Until LOGO is adapted for the Atari, BASIC is the language we use. As much as possible, our curriculum simplifies BASIC so that children are able to direct computers to write programs of their own design. But BASIC was initially designed for adults using time-sharing systems; its graphics depend on coordinate geometry and matrixes that are less obvious than such languages as LOGO.

This is a critical time for microcomputer education. Will we create educational software that fires the desire to learn, or will less inspired programs become the norm? Can we avoid a disparity between computer "haves" and "have nots," or will this technology be a luxury that only well-to-do school systems can afford?

At the Capital Children's Museum, just a short walk from the U.S. Capitol, Future Center is a model classroom that is grappling with these issues. ■